REPORT

FACADE NOISE EXPOSURE ASSESSMENT FOR OUTLINE PLANNING

SITE

LAND EAST OF MANOR TRADING ESTATE, BENFLEET, ESSEX, SS7 4PS

REFERENCE

HA/AD961/V1

HEALTHY ABODE ACOUSTICS
BUILDING ACOUSTICIANS & ENVIRONMENTAL NOISE CONSULTANTS

Our Ref	HA/AD961/V1
Site Address	Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS
For	Smith Brothers (C/O G&K Groundworks Ltd)
Client Address	Unit 30, Brunel Road, Benfleet, Essex, SS7 4PS
Date of Report	17 December 2021
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EXECUTIVE SUMMARY

- G&K Groundworks Ltd Instructed Healthy Abode Ltd t/a as HA Acoustics to undertake a noise exposure assessment to support an outline planning application for a development which comprises of 68 proposed residential dwellings, a single general industrial unit and two storage and distribution units located at Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS.

- HA Acoustics has undertaken an environmental noise survey at the site in order to determine prevailing ambient, background and maximum noise levels that are representative of the residential premises.

- An unattended noise survey was conducted between Monday 23rd November 2021 and Friday 26th November 2021 at three fixed secure monitoring positions deemed representative of the proposed site.

- A baseline environmental noise survey and assessment has been undertaken in line with the guidance contained in British Standard (BS) 8233:2014, measurements being taken over continuous 5-minute periods.

- Existing noise levels at the site have been compared to relevant standards and guidance. The results of the noise survey are considered reasonable given the location of the measurement position and the existing noise sources in the local vicinity. The representative time-averaged ambient and night-time maximum noise levels have been calculated at:
    - NMP1: 57dB $L_{Aeq\ daytime}$, 50dB $L_{Aeq\ night\ time,}$ and 60dB $L_{Amax,F}$.
    - NMP2: 55dB $L_{Aeq\ daytime}$, 46dB $L_{Aeq\ night\ time,}$ and 56dB $L_{Amax,F}$.
    - NMP3: 58dB $L_{Aeq\ daytime}$, 46dB $L_{Aeq\ night\ time,}$ and 58dB $L_{Amax,F}$.
- The assessment has indicated that internal noise levels within the proposed development are predicted to meet the guideline noise criteria contained in BS 8233:2014 provided the identified appropriate minimum specified glazing, ventilation and façade materials are installed to a good manner of workmanship.

- At the time of composing the report the exact specifications of the construction/build of the proposal have not been finalised. Recommendations provided in respect to sound insulation of the building have been proposed based on achieving the desired internal noise levels in BS 8233:2014.

ACOUSTICS

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1. INTRODUCTION

1.1. The proposed development comprises of 68 proposed residential dwellings, a single general industrial unit and two storage and distribution units located at Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS.

1.2. The purposes of this report are:

1.2.1. To determine and assess prevailing ambient, background and maximum noise levels affecting the proposal due to nearby noise sources (e.g. road traffic).

1.2.2. To present desired internal noise levels to be achieved within the residential premises in accordance with BS 8233:2014.

1.2.3. To detail appropriate sound insulation requirements for the purposes of mitigating noise caused by prevailing and potential noise sources such that internal noise levels are achieved.

2. SITE DESCRIPTION AND OBSERVATIONS

2.1. The Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS is hereafter referred to as 'the site'. The site is currently privately owned land, which is currently accessed via Manor Trading Estate to the east. The proposal is to comprises of 68 proposed residential dwellings, a single general industrial unit and two storage and distribution units.

2.2. Figure 2.1 shows the site highlighted in Blue and its surroundings.

Figure 2.1 Site Location and Surrounding Land Use

2.3. The site is located on the outskirts of Benfleet and surrounded by commercial, residential and educational premises. East of the proposed site is a multi-use industrial estate, of which one of the premises is a metal recycling facility (Benfleet Scrap). To the west are residential premises which back onto the proposed site and are accessed via Keswick Road. Immediately south of the site is ECL Benfleet - Hesten Day Centre. Beyond the day centre is The Robert Drake Primary School which is accessed from Church Road.

3. ENVIRONMENTAL NOISE SURVEY METHODOLOGY

3.1. **Environmental Noise Survey**

3.2. An unmanned environmental noise survey was undertaken at three secure measurement locations (see appendix A). The surveys were undertaken between 12:00 hours on 23rd November 2021 and 11:35 on the 26th November 2021.

3.3. Ambient, background and maximum sound pressure level measurements (L_{Aeq}, L_{A90} and $L_{Amax,F}$ respectively) were measured throughout the noise survey with continuous recorded 5-minute periods. The measurement noise positions are indicated in **orange** in Appendix A.

3.4. The sound level meters (SLMs) were positioned 3.5 metre from reflective surfaces (walls/fences) to the front and rear boundary of the proposed development. The SLM's were mounted approximately 2 metres above ground level. The position is considered to be in 'free-field' conditions, so a façade correction has not been applied to the data. The positions were chosen to gain representative noise levels from any noise sources as well as for monitoring equipment security reasons.

3.5. The equipment used for the noise survey is summarised in Table 3.1.

Equipment	Description	Quantity	Serial Number
Larson Davis LXT SE	Class 1 automated logging sound level meter	1	0004960
377BO2 Microphone	Class 1 ½" microphone	1	168839
Larson Davis LXT SE	Class 1 automated logging sound level meter	1	0004966
377BO2 Microphone	Class 1 ½" microphone	1	72656
Larson Davis LXT SE	Class 1 automated logging sound level meter	1	0005445
377BO2 Microphone	Class 1 ½" microphone	1	177077
Svantek SV33A	Class 1 Calibrator	1	58815

Table 3.1 Description of Equipment used for Noise Survey

3.6. The noise survey and measurements were conducted, in accordance with BS7445-1:2003 '*Description and measurement of environmental noise. Guide to quantities and procedures*'. Measurements were made generally in accordance with ISO 1996-2:2007 '*Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels*'.

3.7. The noise monitoring equipment used was calibrated before and after the noise survey period. No significant drift was recorded. Equipment calibration certificates can be provided upon request.

3.8. **Weather Conditions**

3.9. Weather conditions during installation and manual measurements were noted to be cold (approx. 8° Celsius), dry, with clear skies to cloudy skies (40% - 60% cloud cover) and a light wind (<5m/s).

3.10. Weather conditions throughout the entire noise survey period were noted to be predominantly cold (approx. 0 to 10° Celsius), generally dry, and a light wind (<5m/s).

3.11. At time of collection the weather conditions were cold (approx. 9° Celsius), dry, with cloudy skies (70%-90% cloud cover) and a light wind (<5m/s).

3.12. These weather conditions were checked against and confirmed by the use of the Met Office mobile application available on smart phone technology. These conditions were generally maintained throughout the whole survey period and are considered reasonable for undertaking environmental noise measurements.

3.13. **Attended Environmental Noise Survey (Manual Measurements)**

3.14. An attended environmental noise survey was undertaken at two measurement locations (see Appendix A). The surveys were undertaken between 12:39 – 13:19 hours on 23 November 2021.

3.15. Ambient, background and maximum sound pressure level measurements (L_{Aeq}, L_{A90} and $L_{Amax,F}$ respectively) were measured throughout the noise survey with continuous recorded 5 minute periods. The measurement position is indicated in **red** in Appendix A.

3.16. The sound level meter (SLM) was positioned over 3.5 metre from reflective surfaces (walls/fences) to the north and west boundary of the neighbouring metal recycling facility. The SLM was mounted approximately 1.5 metres above ground level. The position is considered to be in 'free-field' conditions, so a façade correction has not been applied to the data.

3.17. The equipment used for the attended noise survey is summarised in Table 3.2.

Equipment	Description	Quantity	Serial Number
Svantek 977	Class 1 automated logging sound level meter	1	69701
ACO Pacific 7052E	Class 1 ½" microphone	1	71699
Svantek SV33A	Class 1 Calibrator	1	58815

Table 3.2 Description of Equipment used for attended Noise Survey

3.18. The noise survey and measurements were conducted, in accordance with BS7445-1:2003 '*Description and measurement of environmental noise. Guide to quantities and procedures'*. Measurements were made generally in accordance with ISO 1996-2:2007 '*Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels*'.

3.19. The noise monitoring equipment used was calibrated before and after the noise survey period. No significant drift was recorded. Equipment calibration certificates can be provided upon request.

3.20. Weather conditions during installation and manual measurements were noted to be cold (approx. 8° Celsius), dry, with clear skies to cloudy skies (40% - 60% cloud cover) and a light wind (<5m/s). Weather conditions were checked against and confirmed by the use of the Met Office mobile application available on smart phone technology. These conditions were generally maintained throughout the whole survey period and are considered reasonable for undertaking environmental noise measurements.

ACOUSTICS

4. NOISE EMISSION CRITERIA

4.1. National Planning Policy Framework (2012, 2019)

4.2. In March 2012, the National Planning Policy Framework (NPPF) came into force and was revised in February 2019. This document replaces a great many planning guidance documents, which previously informed the planning system in England.

4.3. The NPPF (2019) sets out the Government's economic, environmental and social planning policies for England and these policies articulate the Government's vision of sustainable development.

4.4. The Noise Policy Statement for England (NPSE) published 2010 applies to *'all forms of noise, including environmental noise, neighbour noise and neighbourhood noise'.*

4.5. **Paragraph 180 of the NPPF (2019) considers noise, stating:**

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."

4.6. National Planning Policy is guided by the NPPF. With regard to noise, the terms 'significant adverse impact' and 'other adverse impacts' are defined in the explanatory notes of the 'Noise Policy Statement for England' (NPSE). These state that there are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

- 'NOEL – No Observed Effect Level, this is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise, and

- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

4.7. Extending these concepts for the purpose of this NPSE leads to the concept of SOAEL - significant observed adverse effect level. This is the level above which significant adverse effects on health and quality of life occur'. However, no specific noise limits for LOAEL and SOAEL have been defined. Therefore, guidance from other acoustic standards must be employed to determine suitable levels within the overall principal of the National Planning Policy Framework, such as BS 8233:2014.

4.8. **Local Authority Requirements**

4.9. The proposed site lies within the jurisdiction of the Local Authority, Castle Point Borough Council. An acoustic report is required to support an outline planning application.

4.10. **BS 8233: 2014**

4.11. Local Authorities usually stipulate internal noise criteria for new build residential uses based on British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'.

4.12. BS 8233: 2014 provides references and guideline values for desirable indoor ambient noise levels for dwellings as shown in Table 4.1 below.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 4.1 BS 8233:2014 Desirable Internal Ambient Noise Levels for Dwellings

4.13. The table is noted to apply to external noise as it affects the internal acoustic environment from sources without a specific character. The above internal ambient noise levels are therefore considered appropriate within this assessment.

4.14. BS 8233: 2014 states that 'for traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed an upper guideline value of 55dB L_{Aeq}, which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances…in higher noise areas, such as city

centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited'.

4.15. **BS 4142: 2014 +A1: 2019**

4.16. BS 4142: 2014 +A1: 2019 "Methods for Rating and Assessing Industrial and Commercial Sound" presents a method for assessing the significance and possible adverse impact due to an industrial or commercial noise source, based on a comparison of the source noise levels and the background noise levels, both of which are measured or predicted at a noise sensitive receiver e.g. a residential property.

4.17. The specific noise level due to the source is determined, with a series of corrections for tonality, impulsivity, intermittency or any other unusual characteristic. This can result in a maximum total correction of +21dB being added if the new noise source demonstrates all the above characteristics. The background noise level is then subtracted from the rating level and a comparison made.

4.18. The significance of the new noise source and the likelihood of any adverse impact is determined in accordance with the following advice:

"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

5. NOISE SURVEY RESULTS

5.1. Environmental Noise Survey Results (unattended)

5.2. The average-ambient and noise levels at the measurement positions during the survey have been based on an analysis of the monitoring data and are summarised in Table 5.1. A time history of the noise monitoring data is provided in Appendix B.1 - B.3.

Monitoring Position	Period	Measured External Sound Pressure Level, dB
Noise Measurement Position 1 (NMP1)	Daytime (07:00 - 23:00)	57 $L_{Aeq,T}$
	Night-time (23:00 - 07:00)	50 $L_{Aeq,T}$
	Night-time (23:00 - 07:00)	[2] 60 $L_{Amax,F}$
Noise Measurement Position 2 (NMP2)	Daytime (07:00 - 23:00)	55 $L_{Aeq,T}$
	Night-time (23:00 - 07:00)	46 $L_{Aeq,T}$
	Night-time (23:00 - 07:00)	[2] 56 $L_{Amax,F}$
Noise Measurement Position 3 (NMP3)	Daytime (07:00 - 23:00)	58 $L_{Aeq,T}$
	Night-time (23:00 - 07:00)	46 $L_{Aeq,T}$
	Night-time (23:00 - 07:00)	[1] 58 $L_{Amax,F}$

Table 5.1 Noise Survey Results

[1] 10th highest measured noise level [2] 12th highest measured noise level

5.3. BS 8233:2014 does not provide specific guidance on night time $L_{Amax,F}$ criteria therefore maximum levels are based on World Health Organisation (WHO) 'Guideline for Community Noise' (2009) and WHO 'Environmental Noise Guidelines for the European Region' (2018) guidance and ProPG: 2017 guidance.

5.4. It is stated that for suitable sleeping conditions, 45dB $L_{Amax,F}$ should not be exceeded by more than 10-15 times a night within a bedroom. For robustness, the $L_{Amax,F}$ noise levels presented above is the not normally exceeded (NNE) 10th and 12th highest measured between 23:00 and 07:00 hours. This $L_{Amax,F}$ noise level then needs to be reduced to 45dB internally to comply with the night time internal noise level.

5.5. **Environmental Noise Survey Results (attended)**

5.6. The average-ambient and noise levels at the attended survey measurement position have been based on an analysis of the monitoring data and are summarised in Table 5.2.

Measurement Start – End Time	Ambient Noise Level $L_{Aeq, 5min}$	Background Noise Level $L_{A90, 5min}$	Maximum Noise Level $L_{AFmax,}$
Manual Measurement Position 1 (MP1)			
12:39 – 12:44	67dB	63dB	85dB
12:44 – 12:49	66dB	63dB	75dB
12:49 – 12:54	63dB	62dB	70dB
Manual Measurement Position 2 (MP2)			
13:04 – 13:09	63dB	60dB	74dB
13:09 – 13:14	63dB	60dB	75dB
13:14 – 13:19	64dB	61dB	82dB

Table 5.2 Summary of noise manual measurement data

5.7. The subjective comments recorded during the manual measurement survey are summarised in table 5.3.

Measurement Start – End Time	Subjective measurement Comments
Manual Measurement Position 1	
12:39 – 12:44	Metal waste compactor ramp down at 12.39:27 and then Idled after this. The compactor ramped up to full operating SPL and excavator dumped metal into compactor at 12:40:05. At 12:43:07 another dump of metal into crusher occurred.
12:44 – 12:49	Metal waste compactor idled from 12:47:23. No other site movement noticeable.
12:49 – 12:54	Metal waste compactor idled for duration of measurement. No other site movement noticeable.
Manual Measurement Position 2	
13:04 – 13:09	Metal waste compactor ramp down at 13.04:32 to Idle. The compactor ramped up to full operating SPL at 13:05:20. At 13:08:23 a dump of metal into compactor occurred.
13:09 – 13:14	Metal waste compactor ramp down at 13:12:15 to Idle. The compactor ramped up to full operating SPL at 13:12:30. At 13:12:41 a dump of metal into compactor occurred.
13:14 – 13:19	Metal waste compactor idled for duration of measurement. No other site movement noticeable.

Table 5.3 Summary of manual measurement subjective comments

6. NOISE IMPACT ASSESSMENT

6.1. **Neighbouring Metal Waste Facility**

6.2. Bordering the site immediately to the east is Benfleet Scrap Ltd, a metal recycling facility and there is a potential for noise arising from the mechanical plant and waste disposal activities that occur from this location, which could impact the proposed residential premises.

6.3. Access to Benfleet Scrap to measure the specific noise levels was not possible. Therefore, unattended noise monitoring was undertaken over multiple days during the week period, to be inclusive of the operational hours of the metal recycling facility (07:30 – 17:00 Monday to Saturday).

6.4. The noise survey was predominantly unmanned; therefore, a subjective assessment of background and ambient noise sources could not be undertaken for the whole monitoring duration. However, during installation and collection of the monitoring equipment, the dominant noise sources emanated from the neighbouring metal recycling facility. The following sources were noted:

- 1x Metal waste compactor
- 4 x Tracked excavator
- Occasional bang/impulsive noise due to dumping of materials

6.5. During installation of the monitoring equipment, an attended measurement survey was carried out during which subjective comment were noted. Table 5.3 summarises the subjective comments.

6.6. Due to the comments recorded during the subjective noise assessment, a 'penalty' addition has been added to calculations/noise modelling due to the noise characteristics of metal recycling facility. For intermittency (+3dB) as the operation is considered to be such that it could attract attention at the NSR. A penalty has been applied for tonality (+2dB) as spectral data of the recycling facility show some tonal characteristics. Penalty additions have also been applied for impulsiveness (+6dB) due to a quick and noticeable change in overall sound pressure level. The cumulative penalty of +11dB has been added.

6.7. Recommendations have been given within the acoustic report; for acoustic screening, building materials and glazing in relation to the measurement and site to ensure a good quality of acoustic design is included throughout.

6.8. **Proposed Industrial units**

6.9. The proposed scheme details a single industrial unit and two storage and distribution units to the north of the development. there is a potential for noise arising from this location, which could impact the proposed residential premises. At time of assessment full details regarding the site use (i.e. number of deliveries, use of roll cages etc.) was not available. For this reason, following planning consent further acoustic assessments should carried out prior to occupation of the proposed industrial buildings. This is to ensure that any noise mitigation/limits can be incorporated to prevent an adverse impact at the proposed nearby residential properties. It should be noted that it is proposed to install a 2.4 metre acoustic barrier separating the industrial buildings from the residential properties. This is to protect the amenity of the future occupiers of the neighbouring residential buildings and will also provide a direct line of sight block. It is proposed that all vehicular movements in relation to the proposed industrial building will access the site via Manor Trading Estate. This will reduce the road traffic noise experience by the future occupants.

6.10. **Proposed commercial units**

6.11. The proposed scheme details three commercial units to the east of the development. There is a potential for noise arising from mechanical plant this location, which could impact the proposed residential premises. Due to the stage of planning, full details regarding any air handing units or other associated plant were unavailable. For this reason, following planning consent further acoustic assessments of any proposed mechanical plant should be carried once information is available. This is to ensure that any noise mitigation can be incorporated to prevent an adverse impact at the proposed residential properties.

7. SITE SUITABILITY FOR RESIDENTIAL DEVELOPMENT

7.1. With appropriate sound insulation measures and building construction as exampled within this report the proposed site is capable of achieving the recommended internal noise levels in the premises. The façade construction is proposed to be of brick and block. All major building elements should be tested in accordance with BS EN ISO 140-3:1995.

7.2. Sound reduction performance calculations have been undertaken to determine the internal noise levels and performance of the glazed and non-glazed elements as outlined in Table 6.1. The specification has been adopted to achieve the night-time level (23:00 – 07:00 hours) for bedrooms, 30dB $L_{Aeq\ 8hour}$ and for the daytime (07:00 – 23:00) for living rooms, 35dB $L_{Aeq\ 16hour.}$ Values of the night-time period have been also applied to the calculated sound reduction index of the glazed element to confirm the limit of 45 $L_{Amax,F,}$ is also achieved for single events during the night.

Façade	Period	Internal Sound Pressure Level Requirement, dB
Façade Specification	Daytime (07:00 – 23:00)	35 dB $L_{Aeq,T}$
	Night-time (23:00 – 07:00)	30 dB $L_{Aeq,T}$
	Night-time (23:00 – 07:00)	45 dB $L_{Amax,F}$

Table 6.1 Required Sound Insulation Performance

7.3. As this report has been produced for an outline planning application, no finalised architectural plans have been produced at this time, therefore the following assumptions have been made:

Bedroom dimensions:

- Dimensions = 3.5m x 3m x 2.4m
- Volume = 25.2m^3
- External façade = 15.6m^2
- Glazing = 6m^2

Living Room dimensions:

- Dimensions = 4m x 3.5m x 2.4m
- Volume = 33.6m^3
- External façade = 18m^2
- Glazing = 8m^2

7.4. Suggested glazing units and building element specifications other than those provided below may be suitable but should be checked before purchase or installation. The analysis is provided to demonstrate that a design solution is feasible at the site for the purposes of meeting the requirements of the Local Authority.

8. NOISE MODEL

7.1 Noise modelling of the site has been undertaken using SoundPLAN Essential 5.1 to determine the levels at the proposed development façade and external amenity areas. For robustness, the noise model assessment is representative of the daytime periods (07:00 – 23:00) so as to be inclusive of the operating hours of the neighbouring metal waste facility.

7.2 Receiver positions representative of site was chosen. Appendix D shows the predicted daytime noise levels in noise map format.

7.3 In predicting the sound levels across the site we have made the following assumptions:

- The total sound level recorded only stems from the noise sources present in the metal recycling facility.
- The sound spectra used for the waste compactor and excavators are as stated in BS5228-1:2009+A1:2014. The levels were then amplified to match the unattended measurement results.
- The equipment referenced from BS5228-1:2009+A1:2014 are as follows:
    - Appendix C8.1 - Waste Compactor 392Kw
    - Appendix C8.11 – Tracked Excavator 228Kw
- The noise source within the metal recycling facility is assumed to be in operation for 100% of the time for the duration of the opening hours (07:30 – 17:00).
- Source height for the excavators is 1.5 metres and 3 metres for the waste compactor.
- Receiver heights are set at 1.5 metres height. Conditions are free-field and there is no reverberant field.
- Receiver points are 1 metre from the building façade.
- No transmission of sound through the barrier.
- No transmission under the barrier.
- Calculations with an acoustic barrier installed at 12 metres to the rear of the proposed offices and 2.4 metres height between the proposed industrial and residential buildings.
- All modelling includes the BS4142:2014+A1:2019 characteristic penalties.

Receiver Position	NMP1 North Façade	NMP2 East Façade	NMP3 South Façade	NMP4 West Façade
Building 1 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	56 dB(A)	51 - 52 dB(A)	51 dB(A)	57 - 60 dB(A)
Building 2 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	57 dB(A)	55 dB(A)	54 dB(A)	57 dB(A)
Building 3 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	63 dB(A)	54 dB(A)	57 - 60 dB(A)	67 dB(A)
Building 4 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	59 dB(A)	55 dB(A)	60 dB(A)	62 dB(A)
Building 5 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	65 dB(A)	57 dB(A)	61 dB(A)	61 dB(A)
Building 6 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	63 - 68 dB(A)	60 -61 dB(A)	65 dB(A)	67 dB(A)
Building 7 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	56 - 66 dB(A)	54 - 56 dB(A)	56 - 62 dB(A)	68 dB(A)
Building 8 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	56 - 67 dB(A)	54 - 56 dB(A)	60 - 62 dB(A)	69 dB(A)
Building 9 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	57 dB(A)	52 - 54 dB(A)	54 dB(A)	57 - 58 dB(A)
Building 10 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	57 dB(A)	55- 58 dB(A)	57 dB(A)	59 - 64 dB(A)
Building 11 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	59 dB(A)	60 dB(A)	69 dB(A)	70 dB(A)
Building 12 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	71 dB(A)	59 dB(A)	63 dB(A)	66 dB(A)
Building 13 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	61dB(A)	56 dB(A)	68 dB(A)	65 dB(A)
Building 14 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	59 dB(A)	60 dB(A)	66 dB(A)	65 dB(A)
Building 15 Predicted Daytime Noise Level at Façade, $L_{Aeq,16hour}$	58 dB(A)	57 dB(A)	61 dB(A)	62 dB(A)

Table 7.1 Daytime and Night-time Predicted Noise level at the Proposed Façade

9. BUILDING FACADES SUITABILITY

9.1. **Non-Glazed Elements**

9.2. It is assumed that the non-glazed elements of the building will be constructed from brick and block work and internally drylined. This construction would be anticipated to provide a sound reduction performance of at least the figures shown in Table 7.1 when tested in accordance with BS EN ISO, 140-3:1995.

Element	Octave Band Centre Frequency SRI, dB					
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Non-Glazed Element Brick/Block Cavity Wall SRI	41	43	48	50	55	55

Table 7.1 Non-glazed elements assumed sound reduction performance

9.3. The below example of construction provides guidance to a typical wall build which should attenuate external noise such that the internal noise levels are achieved.

- BS 8233 Table E.1A (50-54dB R_W sound insulation) (d) details construction of "Brick laid frogs up, wall nominal 200 mm thickness, weight (including plaster) not less than 380 kg/m^2. Plaster or dry-lined finish both sides. Brickwork joints well filled".

9.4. Given the typical extensive build and construction of external walls in accordance with the Building Regulations it is predicted that this element would provide significant attenuation to achieve the internal noise levels.

9.5. **Roofs**

9.6. Roofs generally have a lower SRI than masonry façade walls, but they are required to reduce noise from external sources. Typical construction and sound insulation values of roofs can be gained from BS 8233:2014, for example a traditional pitched roof with tiles on felt with 100mm mineral wool on plasterboard ceiling has an SRI of approximately R_w 43dB.

9.7. **Glazed Elements**

9.8. Calculations (Appendix C) show that based on monitoring data, façade materials, room sizes and volumes, a minimum of R_w 31dB, R_w, 36 dB, R_w 42dB or R_w 49dB noise reduction is required, dependent on façade location, for all glazed elements to be installed. The performance is specified for the whole window unit, including the frame and other design features such as the inclusion of trickle vents. Sole glass performance data would not demonstrate compliance with this specification. Glazing performance calculations have been based on the measured L_{Aeq} noise levels as recommended by BS 8233:2014.

9.9. The reference reverberation time of 0.5 second is utilised, as stated in BS8233: 2014 and assumes that the dwelling shall have carpeted, fully furnished, occupied bedroom(s).

9.10. The glazing requirements are listed below in table 7.2. These specifications and their acoustic data on octave band frequencies are provided in Appendix C.

Glazing Type	Required Overall Sound Reduction Performance, R_w	Glazing And Ventilation Type – Indicative Only
Specification 1 (Red) ≥ 65 dB(A)	49dB	R_w 49 dB Pilkington (10mm Glass – 200mm Air Gap – 6mm) Double Window Glazing System Mechanical Ventilation (100 $D_{,n,e,w}$)**
Specification 2 (Orange) 61 - 64 dB(A)	42dB	R_w 46 dB Pilkington (10mm Glass – 12mm Air Gap – 16mm) Acoustic Laminate Double Glazing System Mechanical Ventilation (100 $D_{,n,e,w}$)**
Specification 3 (Yellow) 56 – 60 dB(A)	36 dB	R_w 36 dB Pilkington (10mm Glass – 12mm Air Gap – 4mm) Double Glazing System Renson AK43 – Acoustic Trickle Vent (49 $D_{,n,e,w}$)
Specification 4 (Green) ≤55dB(A)	31 dB	R_w 31 dB Pilkington (4mm Glass – 12mm Air Gap – 4mm) Double Glazing System Renson AK43 – Acoustic Trickle Vent (49 $D_{,n,e,w}$)

Table 7.2 Required Glazing specifications

**Based on approximate room sizes*

9.11. The location of the proposed different glazing specifications in relations to the development can be seen in Appendix E.

9.12. **Ventilation**

9.13. In addition to the glazing requirements, internal noise levels should be considered in the context of room ventilation requirements. At the time of writing, full details regarding a ventilation strategy are not available.

9.14. Appendix E provides a markup of the façade specifications required to meet BS8233:2014 requirements. Area where specification 1 (red) and 2 (orange) have been recommended, an alternative ventilation strategy is recommended. This is due these facades being subject to external noise level would likely cause an internal noise level increase above BS 8233:2014 recommended internal levels if openable windows were to be used due to overheating. For this reason, mechanical ventilation has been used in the acoustic calculations so as to permit a continuous flow of ventilation whilst enabling sufficient sound attenuation to meet the BS8233:2014 requirement.

9.15. **Detailed Design Stage Notes:**

9.16. The analysis is provided to demonstrate that a design solution is feasible at the site for the purposes of meeting the requirements of the Local Authority local policy and British Standard internal design criteria and therefore to produce a noise impact assessment to be supplied in support of the planning application.

9.17. Following planning consent, then it is usual that the architect will produce full building regulation drawings. At which time, structural chartered engineers, thermal engineers, M+E and acoustic engineers will be engaged to input on the detailed design. As part of this detailed design stage, it is strongly recommended that further acoustic analysis of the individual specified components and if necessary further recommendations, specifications be undertaken.

9.18. Acoustic calculations to determine the glazing and ventilation strategy should also be re-run should the room sizes and percentage of glazing differ from that assumed above.

10. EXTERNAL AMENITY SUITABILITY

10.1. Noise monitoring data and modelling confirms that the external amenity areas exceed BS8233:2014 and WHO (1999) guidance levels.

10.2. For this reason, the client proposes to install a 12-metre-high acoustic fence of good design at the border of the metal recycling facility fixed to the proposed office buildings, so that the development is designed to achieve the lowest practicable levels in these external amenity spaces. Although this will still not meet the requirement, it should bring the levels to between 57-66dB $L_{Aeq,16hours}$ (Inclusive of +11dB penalties). Whilst this is higher than the recommended levels in BS 8233:2014, the context and location of the proposed site should be considered:

10.3. BS 8233:2014 states that *'for traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$ with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances…in higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited'.*

10.4. ProPG 2017 state: '*Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:*

- *A relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *A relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or ProPG Planning & Noise: New Residential Development May 2017 2. Recommended Approach for New Residential Development 18 large open balcony in a different, protected, location); and/or*

- *A relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*

- *A relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.'*

10.5. It is understood that areas of public open space have been incorporated into the scheme. To the south of the site away from the dominant noise source an area of grassland and biodiversity pond is shown on the masterplan layout. This zone could incorporate picnic benches and children's play area. This amenity scheme can be detailed at detailed architectural design stage so as to permit future occupiers' tranquillity.

11. UNCERTAINTY

11.1. The levels of uncertainty in the data and calculations are considered to be low given the robust exercise undertaken in noise monitoring and the confidence in the statistical analysis.

11.2. All measurements taken on-site by instrumentation are subject to a margin of uncertainty. This is relatively small, with a sound level meter manufacturer's margin of uncertainty at +/-1.1dB. It is due to the tolerances associated with the Class 1 sound level meter and calibrator equipment used to measure background.

11.3. The meter and calibrator used have a traceable laboratory calibration and were field calibrated before and after the measurements.

11.4. Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.

11.5. Uncertainties associated with the noise model using SoundPLAN Essential 5.1 are as follows;

- Topographical map data, used to establish the digital ground model, was acquired from The Department for Environment, Food & Rural Affairs national LiDAR survey data.
- Building heights and building floor heights have been estimated. Receptor positions at buildings have been estimated for ground floor level to be best representative of noise sensitive receiver positions based on received drawings and layouts.

12. CONCLUSION

12.1. It is proposed to build a new development that comprises of 68 proposed residential dwellings, a single general industrial unit and two storage and distribution units located at Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS. A noise survey and assessment has been undertaken for the proposed development. Existing noise at the site have been measured and compared to relevant standards and guidance.

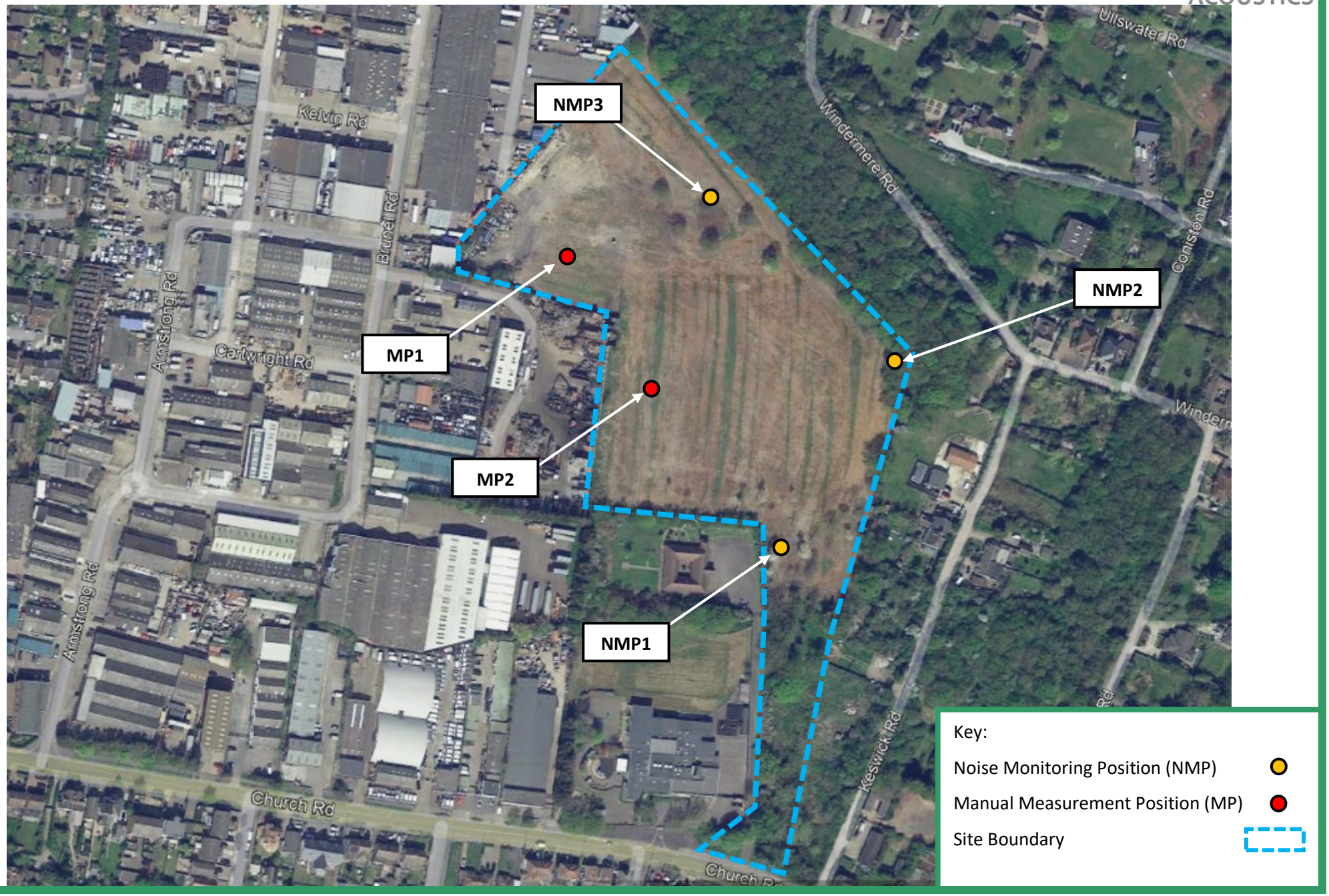
12.2. Calculations (Appendix C) show that based on monitoring data, façade materials, room sizes and volumes, a minimum of R_w 31dB, R_w, 36 dB, R_w 42dB or R_w 49dB noise reduction is required, dependent on façade location, for all glazed elements to be installed. The performance is specified for the whole window unit, including the frame and other design features such as the inclusion of trickle vents. Sole glass performance data would not demonstrate compliance with this specification. Glazing performance calculations have been based on the measured L_{Aeq} noise levels as recommended by BS 8233:2014.

12.3. It is predicted that proposed external amenity spaces will not achieve the World Health Organisation guideline values for noise levels and British Standards 8233:2014 desirable external ambient noise levels of 55dB.

12.4. For this reason, the client proposes to install a 12-metre-high acoustic fence of good design at the border of the metal recycling facility fixed to the proposed office buildings, so that the development is designed to achieve the lowest practicable levels in these external amenity spaces. Although this will still not meet the requirement, it should bring the levels to between 57-66dB $L_{Aeq,16hours}$. Whilst this is higher than the recommended external amenities levels, It is understood that areas of public open space have been incorporated into the scheme. To the south of the site away from the dominant noise source an area of grassland and biodiversity pond is shown on the masterplan layout. This zone could incorporate picnic benches and children's play area. This amenity scheme can be detailed at detailed architectural design stage so as to permit future occupiers' tranquillity.

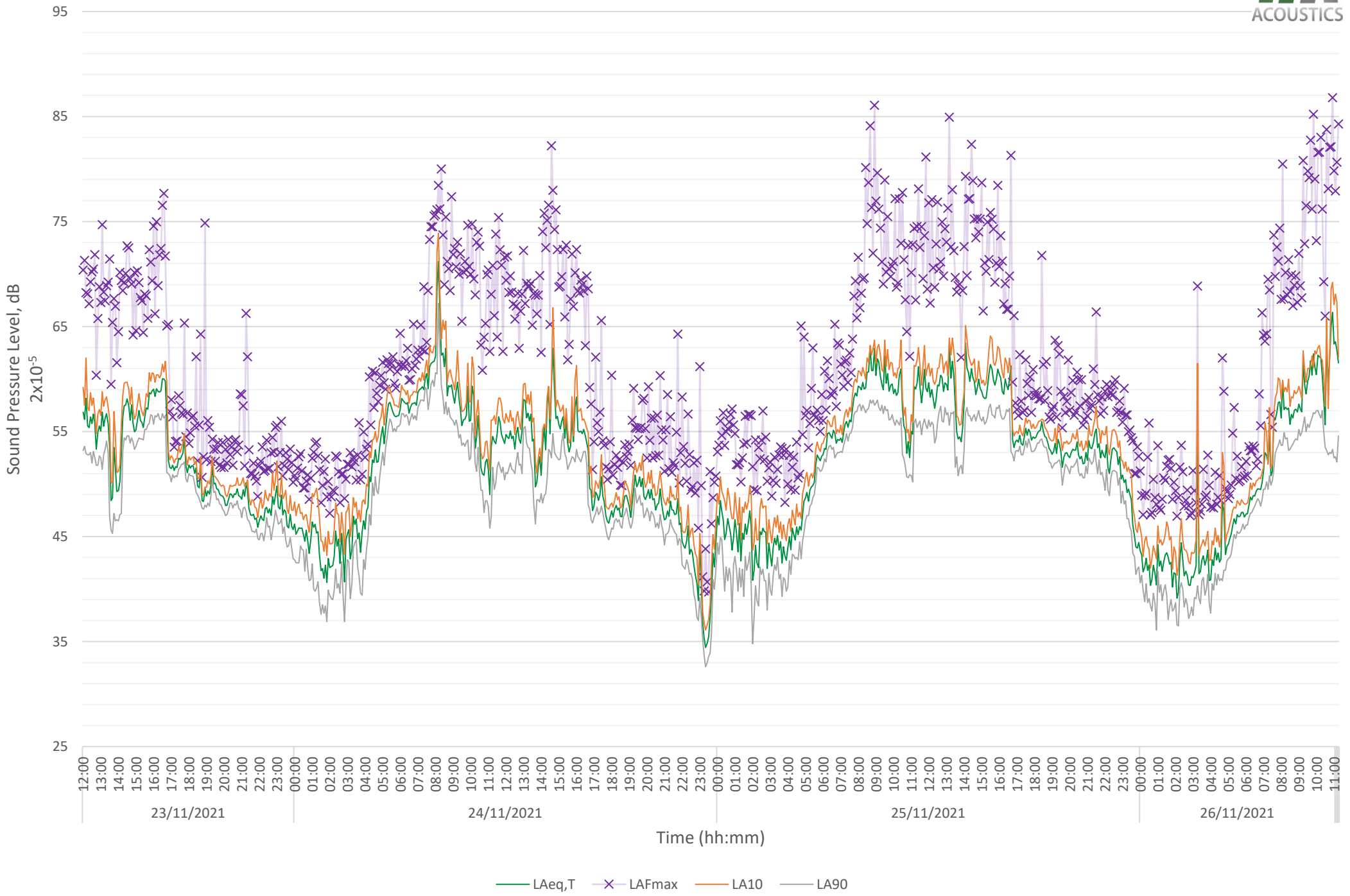
12.5. With appropriate sound insulation glazing and ventilation measures and building construction as exampled within this report the proposed residential premises is more than capable of achieving the guideline internal noise criteria contained in BS 8233:2014.

Appendix A – Site Plan (SP1)



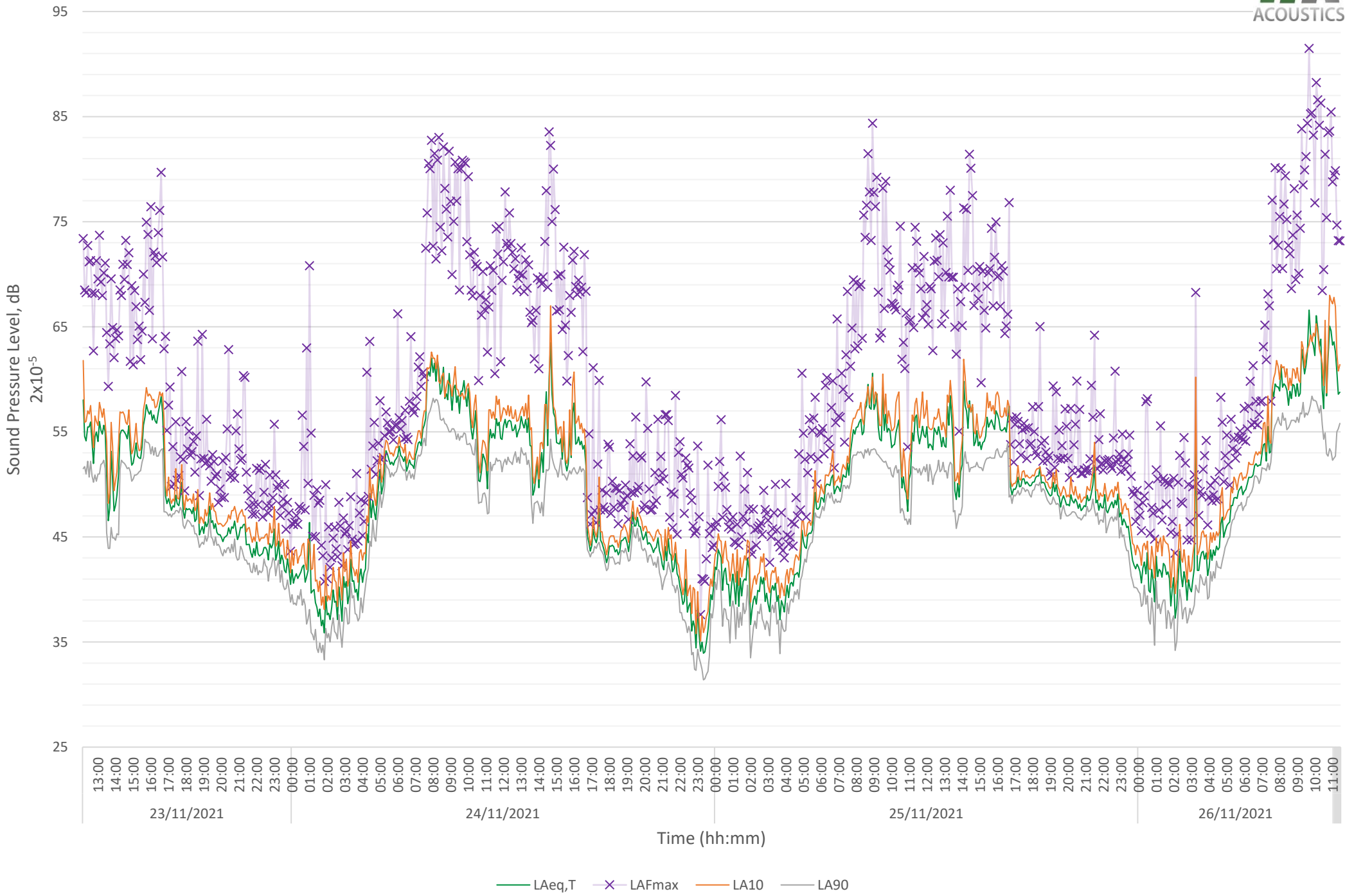
Appendix B.1 - NMP1 Time History

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS



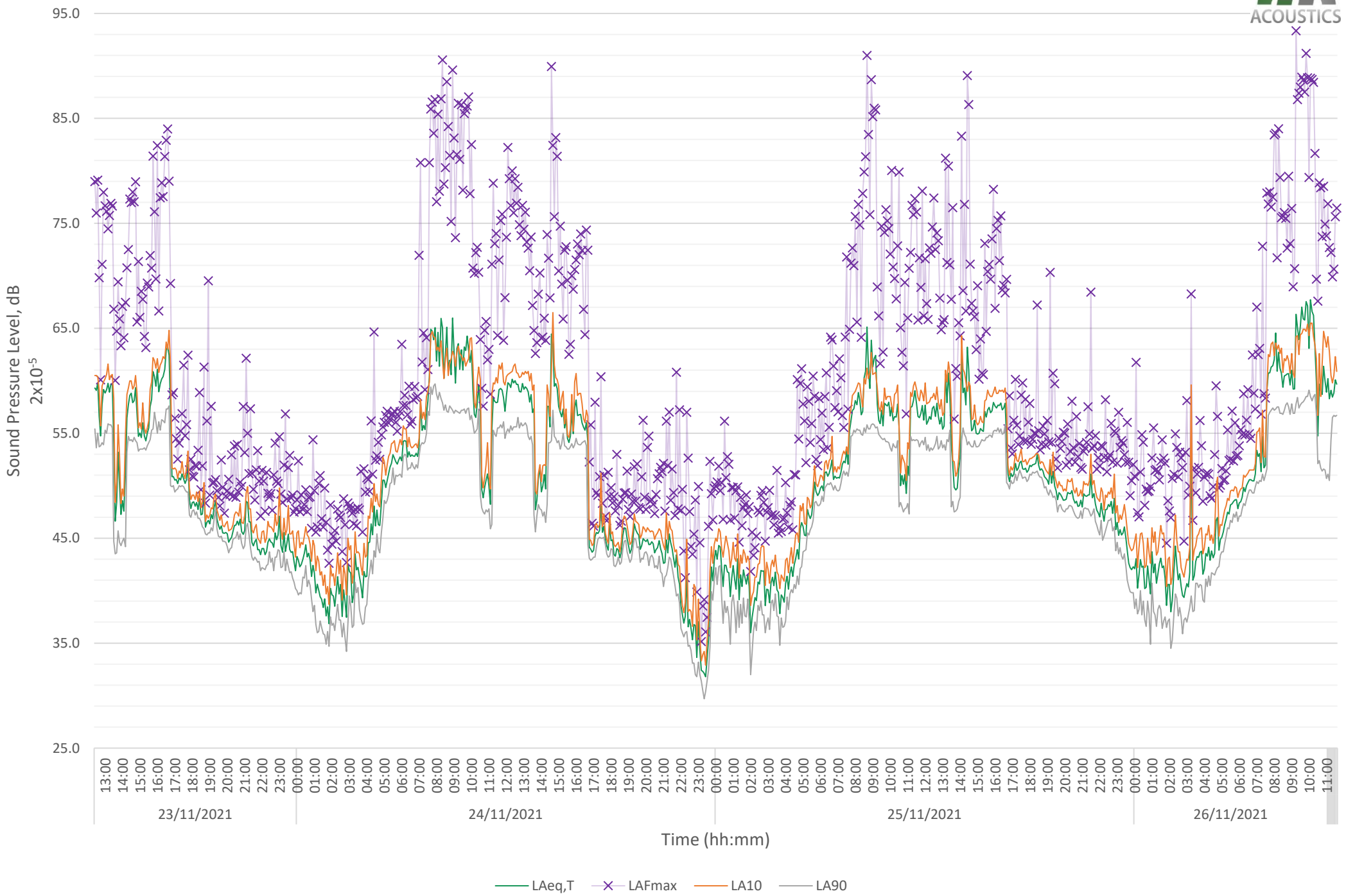
Appendix B.2 - NMP2 Time History

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS



Appendix B.3 - NMP3 Time History

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS



Appendix C.1

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS
Glazing Specification 1 (Red ≥65dBA) Bedroom

BS EN 12354-3 Calculation to determine glazing specification

Habitable room data variables

Type of habitable room	Bedroom		**Based on approximate measured room sizes*
Volume	25.2	cubic metres	
Total area - external façade(s)	15.6	square metres	
Total area - window(s)	6.0	square metres	
L(k)	3		
Lmax (K)	3		
Trickle Ventilator(s)	5		
Solid Façade (exc. windows)	9.6	square metres	
Reverberation Time	0.5	seconds	

External noise level

	1:1 Octave Bands Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Logged Log average daytime Leq	73	68	67	68	68	63	55	**71**
Logged Log average night-time Leq	52	47	43	45	44	33	25	**47**
Logged Lmax for duration of survey	63	59	58	57	52	47	44	**58**

Sound reduction of building fabric

	1:1 Octave Band Centre Frequency (Hz)							Rw /
	63	125	250	500	1000	2000	4000	Dn,e,W
49 Rw - 10/200/6mm double window	33	35	46	46	46	56	65	**49**
Standard Masonry from Template Report	39	41	43	48	50	55	55	
100 Dn,e,w - Mechanical Ventilation	98	100	100	100	100	100	100	**100**

	1:1 Octave Band Centre Frequency (Hz)							
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Reduction from façade	-29.8	-31.8	-38.1	-41.3	-42.2	-49.5	-51.0	
Addition for Ctr	5.0	5.0	5.0	5.0	5.0	5.0	5.0	

Resultant internal noise level

	1:1 Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Daytime internal Leq	48	41	33	31	30	19	9	**34**
Night-time internal Leq	27	20	10	9	6	-11	-21	**11**
Night-time internal Lmax	33	27	20	15	10	-2	-7	**18**

BS8233:2014 - Daytime Design Criterion:	LAeq	35
BS8233:2014 - Night-time Design Criterion:	LAeq	30
Based on BS8233: 1999 Night-time Lmax levels:	LAmax	45

Appendix C.2

ACOUSTICS

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS
Glazing Specification 1 (Red ≥65dBA) Living Room

BS EN 12354-3 Calculation to determine glazing specification

Habitable room data variables

Type of habitable room	Living Room		**Based on approximate measured room sizes*
Volume	33.6	cubic metres	
Total area - external façade(s)	18.0	square metres	
Total area - window(s)	8.0	square metres	
L(k)	3		
Lmax (K)	3		
Trickle Ventilator(s)	10		
Solid Façade (exc. windows)	10	square metres	
Reverberation Time	0.5	seconds	

External noise level

	1:1 Octave Bands Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Logged Log average daytime Leq	73	68	67	68	68	63	55	**71**
Logged Log average night-time Leq	52	47	43	45	44	33	25	**47**
Logged Lmax for duration of survey	63	59	58	57	52	47	44	**58**

Sound reduction of building fabric

	1:1 Octave Band Centre Frequency (Hz)							Rw /
	63	125	250	500	1000	2000	4000	Dn,e,W
49 Rw - 10/200/6mm double window	33	35	46	46	46	56	65	**49**
Standard Masonry from Template Report	39	41	43	48	50	55	55	
100 Dn,e,w - Mechanical Ventilation	98	100	100	100	100	100	100	**100**

	1:1 Octave Band Centre Frequency (Hz)							
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Reduction from façade	-30.1	-32.1	-38.9	-41.8	-42.6	-50.2	-52.0	
Addition for Ctr	5.0	5.0	5.0	5.0	5.0	5.0	5.0	

Resultant internal noise level

	1:1 Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Daytime internal Leq	47	41	33	31	30	18	8	**34**
Night-time internal Leq	26	19	9	8	6	-12	-22	**11**
Night-time internal Lmax	33	27	19	15	10	-3	-8	**17**

BS8233:2014 - Daytime Design Criterion:	LAeq	35
BS8233:2014 - Night-time Design Criterion:	LAeq	n/a
Based on BS8233: 1999 Night-time Lmax levels:	LAmax	n/a

Appendix C.3

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS
Glazing Specification 2 (Orange 61 - 64dBA) Bedroom

BS EN 12354-3 Calculation to determine glazing specification

Habitable room data variables

Type of habitable room	Bedroom	**Based on approximate measured room sizes*
Volume	25.2	cubic metres
Total area - external façade(s)	15.6	square metres
Total area - window(s)	6.0	square metres
L(k)	3	
Lmax (K)	3	
Trickle Ventilator(s)	5	
Solid Façade (exc. windows)	9.6	square metres
Reverberation Time	0.5	seconds

External noise level

	1:1 Octave Bands Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Logged Log average daytime Leq	66	61	60	61	61	56	48	**64**
Logged Log average night-time Leq	52	47	43	45	44	33	25	**47**
Logged Lmax for duration of survey	63	59	58	57	52	47	44	**58**

Sound reduction of building fabric

	1:1 Octave Band Centre Frequency (Hz)							Rw /
	63	125	250	500	1000	2000	4000	Dn,e,W
42 Rw - Pilk 10/12/16mm acoustic laminate	25	27	27	37	45	44	54	**42**
Standard Masonry from Template Report	39	41	43	48	50	55	55	
100 Dn,e,w - Mechanical Ventilation	98	100	100	100	100	100	100	**100**

	1:1 Octave Band Centre Frequency (Hz)							
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Reduction from façade	-23.0	-25.0	-25.1	-34.8	-41.5	-41.8	-48.7	
Addition for Ctr	5.0	5.0	5.0	5.0	5.0	5.0	5.0	

Resultant internal noise level

	1:1 Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Daytime internal Leq	48	41	39	31	24	19	4	**34**
Night-time internal Leq	34	27	23	15	7	-4	-19	**18**
Night-time internal Lmax	40	34	33	22	11	6	-5	**27**

BS8233:2014 - Daytime Design Criterion:	LAeq	35
BS8233:2014 - Night-time Design Criterion:	LAeq	30
Based on BS8233: 1999 Night-time Lmax levels:	LAmax	45

Appendix C.4

ACOUSTICS

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS
Glazing Specification 2 (Orange 61 - 64dBA) Living Room

BS EN 12354-3 Calculation to determine glazing specification

Habitable room data variables

Type of habitable room	Living Room	
Volume	33.6	cubic metres
Total area - external façade(s)	18.0	square metres
Total area - window(s)	8.0	square metres
L(k)	3	
Lmax (K)	3	
Trickle Ventilator(s)	10	
Solid Façade (exc. windows)	10	square metres
Reverberation Time	0.5	seconds

**Based on approximate measured room sizes*

External noise level

	1:1 Octave Bands Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Logged Log average daytime Leq	66	61	60	61	61	56	48	**64**
Logged Log average night-time Leq	52	47	43	45	44	33	25	**47**
Logged Lmax for duration of survey	63	59	58	57	52	47	44	**58**

Sound reduction of building fabric

	1:1 Octave Band Centre Frequency (Hz)							Rw /
	63	125	250	500	1000	2000	4000	Dn,e,W
42 Rw - Pilk 10/12/16mm acoustic laminate	25	27	27	37	45	44	54	**42**
Standard Masonry from Template Report	39	41	43	48	50	55	55	
100 Dn,e,w - Mechanical Ventilation	98	100	100	100	100	100	100	**100**

	1:1 Octave Band Centre Frequency (Hz)							
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Reduction from façade	-23.1	-25.1	-25.2	-34.9	-41.9	-41.9	-49.3	
Addition for Ctr	5.0	5.0	5.0	5.0	5.0	5.0	5.0	

Resultant internal noise level

	1:1 Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Daytime internal Leq	48	41	39	31	24	19	3	**34**
Night-time internal Leq	34	26	23	15	7	-4	-19	**18**
Night-time internal Lmax	40	34	33	22	11	6	-5	**27**

BS8233:2014 - Daytime Design Criterion:	LAeq	35
BS8233:2014 - Night-time Design Criterion:	LAeq	n/a
Based on BS8233: 1999 Night-time Lmax levels:	LAmax	n/a

Appendix C.5

ACOUSTICS

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS
Glazing Specification 3 (Yellow 56 - 60 dBA) Bedroom

BS EN 12354-3 Calculation to determine glazing specification

Habitable room data variables

Type of habitable room	Bedroom		**Based on approximate measured room sizes*
Volume	25.2	cubic metres	
Total area - external façade(s)	15.6	square metres	
Total area - window(s)	6.0	square metres	
L(k)	3		
Lmax (K)	3		
Trickle Ventilator(s)	5		
Solid Façade (exc. windows)	9.6	square metres	
Reverberation Time	0.5	seconds	

External noise level

	1:1 Octave Bands Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Logged Log average daytime Leq	62	57	56	57	57	52	44	**60**
Logged Log average night-time Leq	52	47	43	45	44	33	25	**47**
Logged Lmax for duration of survey	63	59	58	57	52	47	44	**58**

Sound reduction of building fabric

	1:1 Octave Band Centre Frequency (Hz)							Rw /
	63	125	250	500	1000	2000	4000	Dn,e,W
36 Rw - Pilk 10/12/4mm	23	25	22	33	40	43	44	**36**
Standard Masonry from Template Report	39	41	43	48	50	55	55	
49 Dn,e,w - Renson AK43 - Acoustic trickle vent	32	34	40	44	46	48	52	**49**

	1:1 Octave Band Centre Frequency (Hz)							
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Reduction from façade	-20.7	-22.7	-20.2	-30.8	-36.9	-40.0	-41.3	
Addition for Ctr	5.0	5.0	5.0	5.0	5.0	5.0	5.0	

Resultant internal noise level

	1:1 Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Daytime internal Leq	46	39	40	31	25	17	7	**34**
Night-time internal Leq	36	29	28	19	12	-2	-11	**22**
Night-time internal Lmax	42	36	38	26	16	7	3	**31**

BS8233:2014 - Daytime Design Criterion:	LAeq	35
BS8233:2014 - Night-time Design Criterion:	LAeq	30
Based on BS8233: 1999 Night-time Lmax levels:	LAmax	45

Appendix C.6

ACOUSTICS

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS
Glazing Specification 3 (Yellow 56 - 60dBA) Living Room

BS EN 12354-3 Calculation to determine glazing specification

Habitable room data variables

Type of habitable room	Living Room		**Based on approximate measured room sizes*
Volume	33.6	cubic metres	
Total area - external façade(s)	18.0	square metres	
Total area - window(s)	8.0	square metres	
L(k)	3		
Lmax (K)	3		
Trickle Ventilator(s)	10		
Solid Façade (exc. windows)	10	square metres	
Reverberation Time	0.5	seconds	

External noise level

	1:1 Octave Bands Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Logged Log average daytime Leq	62	57	56	57	57	52	44	**60**
Logged Log average night-time Leq	52	47	43	45	44	33	25	**47**
Logged Lmax for duration of survey	63	59	58	57	52	47	44	**58**

Sound reduction of building fabric

	1:1 Octave Band Centre Frequency (Hz)							Rw /
	63	125	250	500	1000	2000	4000	Dn,e,W
36 Rw - Pilk 10/12/4mm	23	25	22	33	40	43	44	**36**
Standard Masonry from Template Report	39	41	43	48	50	55	55	
49 Dn,e,w - Renson AK43 - Acoustic trickle vent	32	34	40	44	46	48	52	**49**

	1:1 Octave Band Centre Frequency (Hz)							
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Reduction from façade	-20.6	-22.6	-20.2	-30.7	-36.6	-39.7	-41.2	
Addition for Ctr	5.0	5.0	5.0	5.0	5.0	5.0	5.0	

Resultant internal noise level

	1:1 Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Daytime internal Leq	46	39	40	31	25	18	7	**35**
Night-time internal Leq	36	29	28	19	12	-2	-11	**22**
Night-time internal Lmax	42	37	38	26	16	8	3	**31**

BS8233:2014 - Daytime Design Criterion:	LAeq	35
BS8233:2014 - Night-time Design Criterion:	LAeq	n/a
Based on BS8233: 1999 Night-time Lmax levels:	LAmax	n/a

Appendix C.7

ACOUSTICS

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS
Glazing Specification 4 (Green ≤ 55 dBA) Bedroom

BS EN 12354-3 Calculation to determine glazing specification

Habitable room data variables

Type of habitable room	Bedroom		**Based on approximate measured room sizes*
Volume	25.2	cubic metres	
Total area - external façade(s)	15.6	square metres	
Total area - window(s)	6.0	square metres	
L(k)	3		
Lmax (K)	3		
Trickle Ventilator(s)	5		
Solid Façade (exc. windows)	9.6	square metres	
Reverberation Time	0.5	seconds	

External noise level

	1:1 Octave Bands Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Logged Log average daytime Leq	57	52	51	52	52	47	39	**55**
Logged Log average night-time Leq	52	47	43	45	44	33	25	**47**
Logged Lmax for duration of survey	63	59	58	57	52	47	44	**58**

Sound reduction of building fabric

	1:1 Octave Band Centre Frequency (Hz)							Rw /
	63	125	250	500	1000	2000	4000	Dn,e,W
31 Rw - Pilk 4/12/4mm	22	24	20	25	35	38	35	**31**
Standard Masonry from Template Report	39	41	43	48	50	55	55	
49 Dn,e,w - Renson AK43 - Acoustic trickle vent	32	34	40	44	46	48	52	**49**

	1:1 Octave Band Centre Frequency (Hz)							
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Reduction from façade	-19.9	-21.9	-18.2	-23.2	-32.8	-35.8	-33.2	
Addition for Ctr	5.0	5.0	5.0	5.0	5.0	5.0	5.0	

Resultant internal noise level

	1:1 Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Daytime internal Leq	42	35	37	34	24	16	10	**34**
Night-time internal Leq	37	30	30	27	16	2	-3	**26**
Night-time internal Lmax	43	37	40	34	20	12	11	**34**

BS8233:2014 - Daytime Design Criterion:	LAeq	35
BS8233:2014 - Night-time Design Criterion:	LAeq	30
Based on BS8233: 1999 Night-time Lmax levels:	LAmax	45

Appendix C.8

ACOUSTICS

Land East of Manor Trading Estate, Benfleet, Essex, SS7 4PS
Glazing Specification 4 (Green ≤55 dBA) Living Room

BS EN 12354-3 Calculation to determine glazing specification

Habitable room data variables

Type of habitable room	Living Room	
Volume	33.6	cubic metres
Total area - external façade(s)	18.0	square metres
Total area - window(s)	8.0	square metres
L(k)	3	
Lmax (K)	3	
Trickle Ventilator(s)	10	
Solid Façade (exc. windows)	10	square metres
Reverberation Time	0.5	seconds

**Based on approximate measured room sizes*

External noise level

	1:1 Octave Bands Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Logged Log average daytime Leq	57	52	51	52	52	47	39	**55**
Logged Log average night-time Leq	52	47	43	45	44	33	25	**47**
Logged Lmax for duration of survey	63	59	58	57	52	47	44	**58**

Sound reduction of building fabric

	1:1 Octave Band Centre Frequency (Hz)							Rw /
	63	125	250	500	1000	2000	4000	Dn,e,W
31 Rw - Pilk 4/12/4mm	22	24	20	25	35	38	35	**31**
Standard Masonry from Template Report	39	41	43	48	50	55	55	
49 Dn,e,w - Renson AK43 - Acoustic trickle vent	32	34	40	44	46	48	52	**49**

	1:1 Octave Band Centre Frequency (Hz)						
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*
Reduction from façade	-19.7	-21.7	-18.2	-23.2	-32.7	-35.7	-33.2
Addition for Ctr	5.0	5.0	5.0	5.0	5.0	5.0	5.0

Resultant internal noise level

	1:1 Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Daytime internal Leq	42	35	37	34	24	16	10	**34**
Night-time internal Leq	37	30	30	27	16	2	-3	**26**
Night-time internal Lmax	43	37	40	34	20	12	11	**34**

BS8233:2014 - Daytime Design Criterion:	LAeq	35
BS8233:2014 - Night-time Design Criterion:	LAeq	n/a
Based on BS8233: 1999 Night-time Lmax levels:	LAmax	n/a

AD961
Land East of Manor
Trading Estate
Benfleet,
Essex,
SS7 4PS

Noise Map Daytime
Existing Site

Author: Jack Tunstall

Prediction based on the following:

BS4142:2014 corrections applied :

+2dB Tonality
+6dB impulsivity
+3dB Intermittency

Noise Sources Included:
(Reference Levels From BS5228:2014)

- 4x Tracked Excavator (228Kw)
- 1x Waste Compactor (392Kw)

Salvage Yard Operating Hours:
07:30 - 17:00

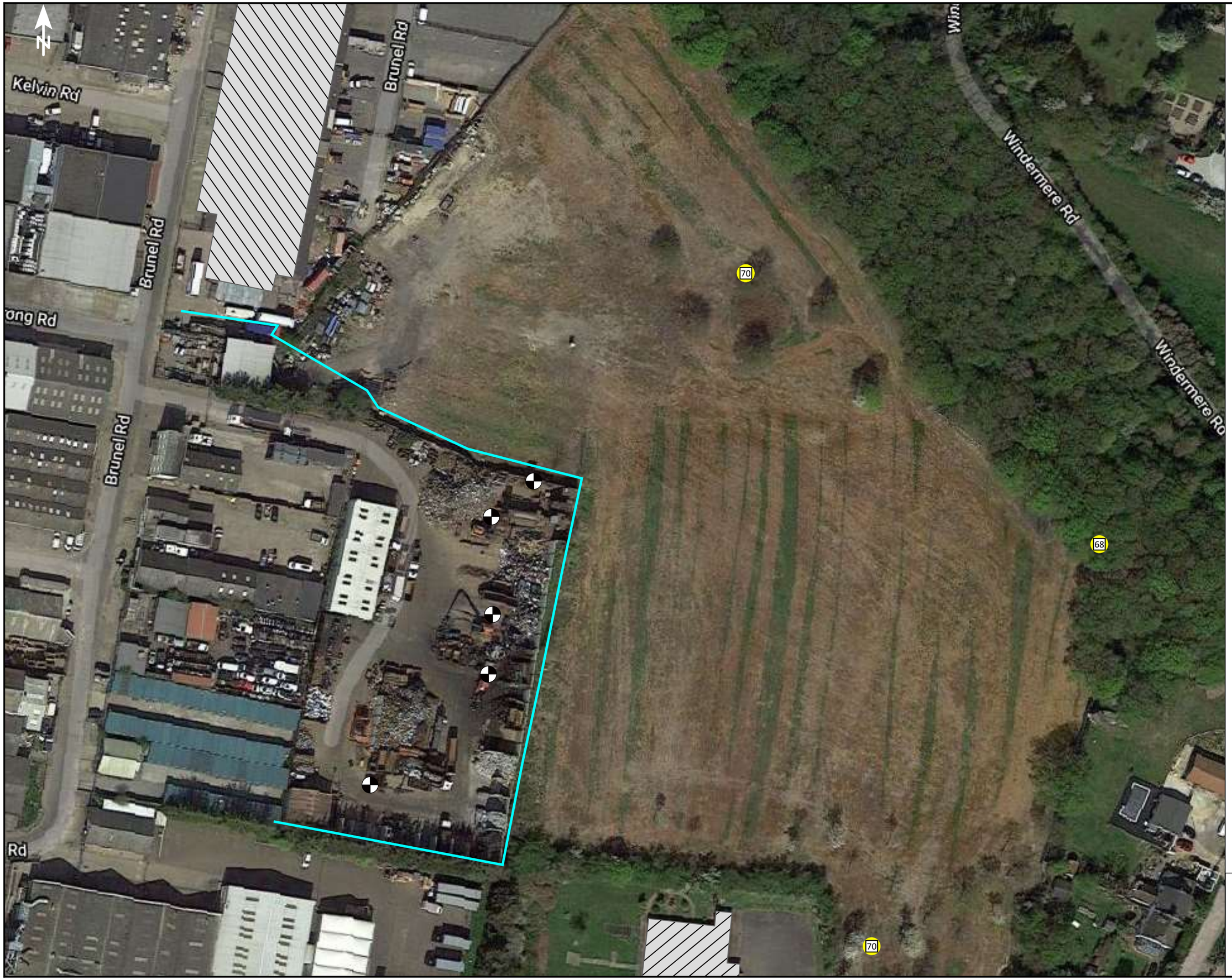
Existing Wall
Existing Building
Noise source

	< 50
50	- 53
53	- 56
56	- 59
59	- 62
62	- 65
65	- 68
68	- 71
71	- 74
74	- 77
77	- 80
80	- 83
83	- 86
86	- 89
89	- 92
	>= 92

1 : 1000

0 5 10 20 30 40 m

ACOUSTICS



AD961
Land East of Manor
Trading Estate
Benfleet,
Essex,
SS7 4PS

Noise Map Daytime
Existing Site

Author: Jack Tunstall

Prediction based on the following:

BS4142:2014 corrections applied :

+2dB Tonality
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+3dB Intermittency

Noise Sources Included:
(Reference Levels From BS5228:2014)

- 4x Tracked Excavator (228Kw)
- 1x Waste Compactor (392Kw)

Salvage Yard Operating Hours:
07:30 - 17:00

Existing Wall
Existing Building
Receiver
Noise source

1 : 1000

0 5 10 20 30 40 m

ACOUSTICS

AD961
Land East of Manor
Trading Estate
Benfleet,
Essex,
SS7 4PS

Noise Map Daytime
Proposed Site
No Acoustic Protection

Author: Jack Tunstall

Prediction based on the following:

BS4142:2014 corrections applied :

+2dB Tonality
+6dB impulsivity
+3dB Intermittency

Noise Sources Included:
(Reference Levels From BS5228:2014)

- 4x Tracked Excavator (228Kw)
- 1x Waste Compactor (392Kw)

Salvage Yard Operating Hours:
07:30 - 17:00

existing industrial u
pumping station compound
water
ng and
areas
64
0.31Ha @ 29dph:
9 UNITS
61
2.4m high acoustic
to commercial site
surface wate
attenu
67
Size 3
development arranged to face onto woo
edge and set back from root protection z
This provides space for the woodland, ba
security for the adjacent premises, passi
surveillance into the woodland edge and
potential overshadowing problems for rea
gardens.
BRUNEL ROAD
El Sub Sta
73
68
71
12m high acoustic barrier formed
by (use class B2) building with
connecting acoustic barrier wall
75
closest residential
build line with 12m
high acoustic barrier
existing scrap yard
crusher/baler machine
60
1.02Ha @ 31dph:
32 UNITS
69
59
55
12m high acoustic barrier fo
Commercial, Business and S
class E) buildings with connecting acoustic barrier
walls between (see conceptual illustration)
line of
20 use
Size 2
75
59
79
78
maintenance access
corridor
Scrap Yard
73
0.61Ha @ 44dph:
27 UNITS
Size 3
existing 5m high concrete
acoustic boundary wall with
concrete slab overspill
68
back gardens to this
of the site as it borde
adjacent rear gardens
backing on to the site
300m2 building footprint
(2 or 2.5 floors gives 600
or 750m2 unit)
73
64
64
70
55
Woodside
Keswick House
Offer for transfer of land
to regularise Heston
Lodge ownership
63

Existing Wall
Proposed building
Existing Building
Receiver
Noise source

1 : 1000

0 5 10 20 30 40 m

ACOUSTICS

AD961
Land East of Manor
Trading Estate
Benfleet,
Essex,
SS7 4PS

Proposed Site
No Acoustic Protection

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Prediction based on the following:

BS4142:2014 corrections applied :

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Noise Sources Included:
(Reference Levels From BS5228:2014)

- 4x Tracked Excavator (228Kw)
- 1x Waste Compactor (392Kw)

Salvage Yard Operating Hours:
07:30 - 17:00

existing industrial u
water
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areas
2.4m high acoustic
to commercial site
surface wat
attenu
0.31Ha @ 29dph:
9 UNITS
development arranged to face onto woo
edge and set back from root protection z
This provides space for the woodland, ba
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build line with 12m
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12m high acoustic barrier fo
Commercial, Business and
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concrete slab overspill
300m2 building footprint
(2 or
r 750m2 unit)
0.61Ha @ 44dph:
27 UNITS
back gardens to this
of the site as it borde
adjacent rear gardens
backing on to the site
Offer for transfer of land
to regularise Heston
Lodge ownership
Woodside
Keswick House

Existing Wall
Proposed building
Existing Building
Noise source

< 55
55 - 58
58 - 61
61 - 64
64 - 67
67 - 70
70 - 73
73 - 76
76 - 79
79 - 82
82 - 85
85 - 88
88 - 91
91 - 94
94 - 97
>= 97

1 : 1000

0 5 10 20 30 40 m

ACOUSTICS

AD961
Land East of Manor
Trading Estate
Benfleet,
Essex,
SS7 4PS

Proposed Site
With Acoustic Protection
Option 1
12m Acoustic Barrier

Author: Jack Tunstall

Prediction based on the following:

BS4142:2014 corrections applied :

+2dB Tonality
+6dB impulsivity
+3dB Intermittency

Noise Sources Included:
(Reference Levels From BS5228:2014)

- 4x Tracked Excavator (228Kw)
- 1x Waste Compactor (392Kw)

Salvage Yard Operating Hours:
07:30 - 17:00

existing industrial u
water
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attenu
BRUNEL ROAD
El Sub Sta
12m high acoustic barrier formed by (use class B2) building with connecting acoustic barrier wall
existing scrap yard crusher/baler machine
12m high acoustic barrier fo
Commercial, Business and S
class E) buildings with connecting acoustic barrier
walls between (see conceptual illustration)
line of
20 use
Scrap Yard
maintenance access corridor
existing 5m high concrete acoustic boundary wall with concrete slab overspill
300m2 building footprint (2 or 2.5 floors gives 600 or 750m2 unit)
Offer for transfer of land to regularise Heston Lodge ownership
pumping station compound
0.31Ha @ 29dph:
9 UNITS
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This provides space for the woodland, ba
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gardens.
closest residential build line with 12m high acoustic barrier
1.02Ha @ 31dph:
32 UNITS
0.61Ha @ 44dph:
27 UNITS
back gardens to this
of the site as it borde
adjacent rear gardens
backing on to the site
Woodside
Keswick House
Size 2
Size 3

Existing Wall
Acoustic Barrier
Proposed building
Existing Building
Receiver
Noise source

1 : 1000

0 5 10 20 30 40 m

ACOUSTICS

AD961
Land East of Manor
Trading Estate
Benfleet,
Essex,
SS7 4PS

Proposed Site
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Salvage Yard Operating Hours:
07:30 - 17:00

Existing Wall
Acoustic Barrier
Proposed building
Existing Building
Noise source

	< 55
	55 - 58
	58 - 61
	61 - 64
	64 - 67
	67 - 70
	70 - 73
	73 - 76
	76 - 79
	79 - 82
	82 - 85
	85 - 88
	88 - 91
	91 - 94
	94 - 97
	>= 97

1 : 1000

0 5 10 20 30 40 m

ACOUSTICS

AD961
Land Easr of Manor
Trading Estate,
Benfleet,
Essex,
SS7 4PS

Proposed Site
12m Acoustic Barrier

Author: Jack Tunstall

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Woodside
Keswick House
Size 2
Size 3

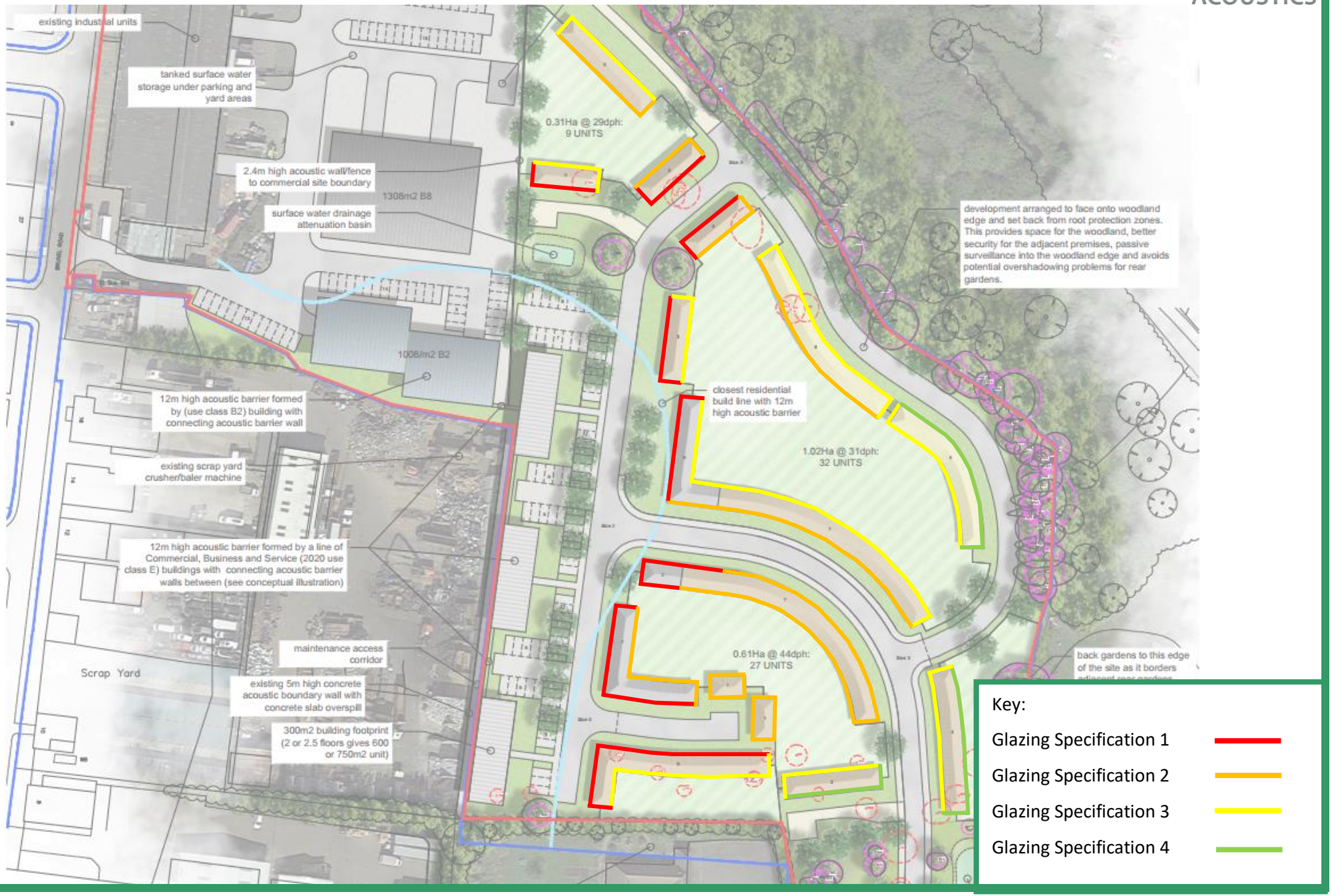
Existing Wall
Acoustic Barrier
Proposed building
Existing Building
Receiver
Noise source

1 : 1000

0 5 10 20 30 40 m

ACOUSTICS

Appendix E – Façade Glazing Markup



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